

REMARKS

This is in response to the Office Action dated November 17, 2003. The Office Action first rejects claims 1-2, 9-11, 18-19, 26-29, 36-39 and 46-47 under 35 U.S.C. §102(a) as being anticipated by Dent., US Patent No. 5,831,977 ("Dent"). The Office Action also rejected claims 3-5, 7, 12-14, 16, 20-22, 24, 30-32, 34, 40-42 and 44 under 35 U.S.C. §103(a) as being unpatentable over Dent in view of Magnusson et al., US Patent No. 6,136,524 ("Magnusson"). Finally, the Office Action rejects claims 6, 8, 15, 17, 23, 25, 33, 35, 43 and 45 under 35 U.S.C. §103(a) as being unpatentable over Dent in view of Magnusson, further in view of Easton, U.S. Patent No. 5,764, 687 ("Easton").

Applicants respectfully traverse the above rejections. Claims 1-47 remain under consideration.

As is well known in the art, in a CDMA system, the signals of all wireless terminals share a frequency band and are sent together in time. The signals of different wireless terminals are differentiated using spreading codes. Each wireless terminal is assigned a unique spreading code that the wireless terminal uses to generate an encoded signal over a wide band of frequencies. At the receiver (e.g., at the base station), the encoded signal is decoded using known signal processing techniques.

The present invention arises out of the realization that the interference experienced by a wireless terminal in a CDMA wireless communication system is a result of a synergy between the spreading code assigned to the wireless terminal and the particular wireless channel through which the signals of the wireless terminal pass. Thus, by assigning spreading codes to wireless terminals based on the propagation characteristics of the wireless channel, the total interference among the wireless terminals is reduced and performance of the overall wireless communication system is improved. As is plainly obvious to one skilled in the art, spreading codes in a CDMA system are assigned to the wireless terminal for use in transmitting wireless signals from the wireless

terminal to a base station receiver. This is quite simply how a CDMA system operates.

102(e) Rejection: Dent

5 The Office Action first rejects claims 1-2, 9-11, 18-19, 26-29, 36-39 and 46-47 under 35 U.S.C. §102(a) as being anticipated by Dent. In order for a claim to be anticipated by a reference under 35 U.S.C. §102, all elements of the claim must be taught or disclosed by that reference. Applicants respectfully assert that Dent does not disclose each and every element of the aforementioned claims of
10 the present invention.

Dent is directed to a wireless communications system and, more particularly, to methods of processing signals received by a base station from a mobile terminal.

Claim 1, as previously amended, states:

15 1. A method for assigning codes in a CDMA wireless communication system in which a plurality of wireless terminals communicate via a plurality of channels, said method comprising the steps of:
20 estimating propagation characteristics of said plurality of channels;
 and
 assigning spreading codes to said plurality of wireless terminals based on said estimated propagation characteristics of said channels.

25 Claim 11, as previously amended, states:

 11. A method for assigning a spreading code to a wireless terminal in a CDMA wireless communication system comprising the steps of:
30 estimating propagation characteristics of a communication channel of said wireless terminal; and
 assigning a spreading code to said wireless terminal based on said estimated propagation characteristics of said communication channel.

35 Claim 28, as previously amended, states:

28. Apparatus for communicating with a plurality of wireless terminals via a plurality of channels, said apparatus comprising:
a channel estimator for estimating channel propagation characteristics; and
5 a code optimizer for assigning spreading codes to said plurality of wireless terminals based on said estimated channel propagation characteristics.

10 Claim 38, as previously amended, states:

38. Apparatus for communicating with a plurality of wireless terminals via a plurality of channels, said apparatus comprising:
means for estimating channel propagation characteristics; and
15 means for assigning spreading codes to said plurality of wireless terminals based on said estimated channel propagation characteristics.

Accordingly, independent claims 1, 11, 28 and 38 each contain method or
20 apparatus limitations of “estimating channel propagation characteristics” of one or more wireless communication channels and “assigning spreading codes” to wireless terminals “based on said estimated channel propagation characteristics.”

At no point in Dent, however, does that reference teach or claim assigning
25 spreading codes based on estimated channel propagation characteristics. At various points in Dent, channel propagation characteristics are predicted, estimated or detected. See, for example, claim 27 in Dent. However, these estimations are only used in well-known methods of processing received wireless signals at the base station after those signals are received in order to correct for
30 interference between received signals. The estimations in Dent are not used to assign spreading codes for use by wireless terminals when transmitting wireless signals to the base station.

The present application does not teach correcting for interference after the signals have been received. Instead, the present invention teaches reducing or
35 eliminating any such interference in the first place by assigning spreading codes

to the wireless terminals that will minimize that interference during transmission.
As is stated at page 4, lines 17-20 of the present application:

5 “Interference is reduced at the outset by the assignment of codes based
on channel characteristics, rather than randomly assigning codes at the
outset and trying to remove the interference at the receiver. This
substantially simplifies receiver processing.”

Dent, on the other hand, relies on processing the wireless signals after they have
10 been received at the base station in an attempt to resolve the interference. This
is not the same as the claimed limitation in the present application of “assigning
spreading codes based on estimated channel propagation characteristics.”
Therefore, Dent does not teach all the limitations of claims 1, 11, 28 and 38 and,
therefore, this reference does not anticipate these claims.

15 Therefore, it is respectfully suggested that these claims 1, 11, 28 and 38
are allowable over Dent. It follows that claims 2-10 (dependent upon claim 1),
12-17 (dependent upon claim 11), claims 29-37 (dependent upon claim 28), and
claims 39-47 (dependent upon claim 38) are all allowable over Dent as being
dependent upon an allowable base claim.

20 With regards to claim 18, that claim as previously amended states:

18. A method for use in a CDMA wireless communication system
comprising the steps of:

25 receiving channel propagation characteristics of a plurality of
wireless channels,

 wherein said channel propagation characteristics comprise the
direction of arrival of a path of signal transmission and the propagation
delays experienced by said signal transmission; and

30 assigning codes to a plurality of wireless terminals based on said
received channel propagation characteristics.

Claim 18 contains no limitation characterizing whether the channel
characteristics are estimated or not. Instead, claim 18 teaches “receiving
channel propagation characteristics,” which may or may not be estimated or
35 actual characteristics. However, as was the case with claims 1, 11, 28 and 38, at

no point in Dent does that reference teach receiving channel propagation characteristics (the direction of arrival of a path of signal transmission and/or the propagation delays experienced by that transmission) and assigning spreading codes to a wireless terminal based on those characteristics. Therefore, claim 18
5 is not anticipated by the teachings of Dent. Therefore, it is respectfully suggested that claim 18 is allowable over Dent. It follows that claims 19-27 (dependent upon claim 18) are all allowable over Dent as being dependent upon an allowable base claim.

10 For the foregoing reasons, it is respectfully requested that the rejection of claims 1-2, 9-11, 18-19, 26-29, 36-39 and 46-47 over Dent be removed and that claims 1-47 be allowed.

103(a) Rejections: 1) Dent in view of Magnusson and 2) Dent in view of Magnusson, further in view of Easton

15 The Office Action also rejects claims 3-5, 7, 12-14, 16, 20-22, 24, 30-32, 34, 40-42 and 44 under 35 U.S.C. §103(a) as being unpatentable over Dent in view of Magnusson et al., US Patent No. 6,136,524 ("Magnusson") as well as rejects claims 6, 8, 15, 17, 23, 25, 33, 35, 43 and 45 under 35 U.S.C. §103(a) as being unpatentable over Dent in view of Magnusson, further in view of Easton.

20 In order for an invention to be obvious under 35 U.S.C. §103(a), there must be some suggestion to combine or modify cited prior art references in a manner that would show or suggest the claimed invention. However, as discussed above, Dent does not teach the elements of claims 1, 11, 28 and 38 of "estimating channel propagation characteristics" of one or more wireless
25 communication channels and "assigning spreading codes" to wireless terminals "based on said estimated channel propagation characteristics."

Magnusson is directed to a method for allocating spreading codes in such CDMA systems in away that makes the maximum number of codes available at a given time for channels of different rates and different spreading factors. The
30 spreading codes are related to each other according to a tree-like structure having levels corresponding to communication channel bandwidths. The method

taught by Magnusson includes the steps of: a) setting a search level in a tree-like structure; b) determining whether the search level corresponds to a requested bandwidth for a communication channel; c) if the search level differs from the requested bandwidth, selecting a spreading code at a different level and
5 repeating the previous step until the search level corresponds to the requested bandwidth for the communication channel; d) determining whether a spreading code at the search level is eligible to be allocated to the communication channel; and e) selecting an eligible spreading code for allocation to the communication channel. See, e.g., Magnusson, col. 5 line 61 to col. 6, line 10.

10 Thus, in other words, Magnusson attempts to achieve a specifically requested bandwidth by iteratively searching for a code in a non-random fashion and assigning that code to a transmission. Magnusson teaches that this method assists in efficiently maximizing the number of available codes to allow more users to be serviced, thus leading to a higher overall bandwidth in the system.

15 However, Magnusson does not teach estimating the channel propagation characteristics and assigning spreading codes to wireless terminals based on these estimated characteristics (claims 1, 11, 28 and 38). Nor does this reference teach that the channel propagation characteristics comprise direction of arrival of a signal transmission path and/or the propagation delay experienced
20 by that signal transmission (claim 18). Additionally, there is no suggestion within Magnusson to modify Dent or any other prior art reference in such a way that teaches these claim elements. Accordingly, claims 3-5, 7, 12-14, 16, 20-22, 24, 30-32, 34, 40-42 and 44, which contain all elements of the independent claims 1, 11, 18, 28 and 38 upon which they are dependent, are allowable over Dent in
25 view of Magnusson as being dependent upon an allowable base claim.

Easton teaches a method and apparatus for demodulating a signal in a spread spectrum multiple access communication system employing a pilot forward link. A single time-shared multiply-accumulate (MAC) datapath services a plurality of finger front ends and a searcher front end in the process of
30 producing a demodulated symbol stream and a power control stream that are, in

turn, used to control the transmit power on the reverse link. See Easton, col. 7, lines 40-51.

As is the case with Magnusson, at no point does Easton teach the claim element of estimating the channel propagation characteristics (as claimed in claims 1, 11, 28 and 38 of the present application) and assigning spreading codes to wireless terminals based on these estimated characteristics. Nor does Easton teach that the channel propagation characteristics comprise direction of arrival of a signal transmission path and/or the propagation delay experienced by that signal transmission (as claimed in claim 18 of the present application).

Additionally, there is no suggestion within Easton to modify Magnusson, Dent or any prior art reference or combination of references in such a way that teaches these claim elements. Accordingly, claims 6, 8, 15, 17, 23, 25, 33, 35, 43 and 45, which contain all limitations of the base claims 1, 11, 18, 28 and 38 upon which they depend, are allowable over Dent in view of Magnusson further in view of Easton as being dependent upon allowable base claims.

Regarding claims 8, 17, 25, 35 and 45, the Office Action states:

"claim 8 is combined limitations recited in claims 6-7. Claim 17 is combined limitations recited in claims 15-16. Claim 25 is combined limitations recited in claims 23-24. Claim 35 is combined limitations recited in claims 33-34. Claim 45 is combined limitations recited in claims 43-44. Claims 8, 17, 25, 35 and 45, therefore, are rejected based on rejected claims 6-7, 15-16, 23-24, 33-34 and 43-44 respectively."

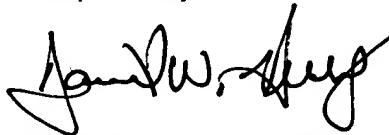
The meaning of this statement is unclear to applicants. As discussed previously, claims 8, 17, 25, 35 and 45 are allowable as being dependent upon allowable base claims 1, 11, 18, 28 and 38, respectively. Is the Office suggesting that, simply because each of the elements in a claim is individually obvious (which in this case they are not obvious for the foregoing reasons), then a claim combining those elements is likewise obvious? Applicants disagree with this position. If the Office maintains that a proper rejection exists in the above-quoted passage, applicants respectfully request that a clarification to this rejection be provided.

Summary

For the foregoing reasons, claims 1, 11, 18, 28 and 38 are not anticipated by Dent and, therefore, these claims are allowable. Accordingly, dependent claims 2-10, 12-17, 19-27, 29-37 and 39-47 are allowable as being dependent upon allowable base claims. Claims 3-8, 12-17, 20-25, 30-35 and 40-45 are also allowable for the additional reason that neither Dent, Magnusson nor Easton teach one or more elements in those claims nor do those references suggest modifying or combining the teachings of those references alone or in combination in a way that discloses all the claimed elements in those claims. Therefore, it is respectfully suggested that the obviousness rejection of claims 3-8, 12-17, 20-25, 30-35 and 40-45 is improper and that these claims are allowable for this additional reason. It is therefore requested that the rejection of these claims be removed.

In light of the foregoing, allowance of all claims remaining under consideration is respectfully requested.

Respectfully,



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Date: February 17, 2004

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